Space Weather Forecast

Issued on Thursday, 22 June 2023 at 13:16 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Radio Blackouts likely throughout. Slight chance of minor geomagnetic storm G1 to end this UTC working week.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate in the last 24 hours, with two Moderate-class flares at 21/1244UTC and 22/1121UTC from the sunspot that produced the Strong-class flare of 20 June in the southeast of the Sun. A third Moderate-class came from a rapidly developing region in the northwest at 21/1538UTC.

There are now up to fifteen sunspot regions on the facing side of the Sun, although this number has been relatively volatile in recent days.

The recent activity in the Strong-class producing region is perhaps somewhat surprising given its outward appearance in visible light, and it only presents as a stable (i.e. little growth) magnetically bipolar region Dso/Beta, although this may yet reveal further spots given a better viewing angle. Also of note is the fact that a 'filament' (arc of plasma) lies in very close proximity to its immediate east - this is something to be monitored. This being said, it appears that the late period Moderate-class flare from the northern portion of the sunspot failed to dislodge this feature.

The other Moderate-class producing region emerged from a blank area of the Sun in the past 30 hours. This was not only responsible for the aforementioned Moderate-class flare, but went on to produce occasional Common-class activity for the remainder of the period.

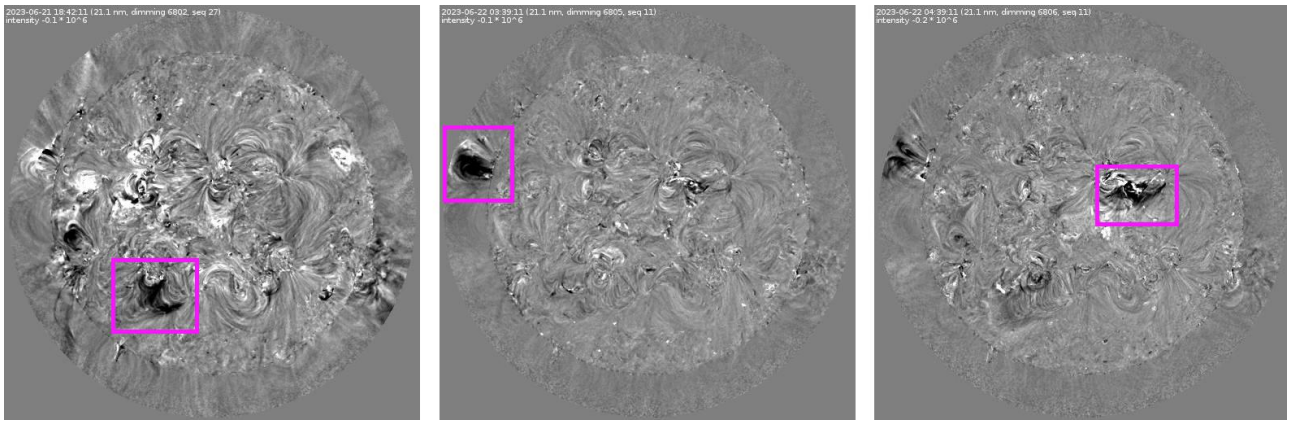

Figure 1: Rogue's gallery of three of the many candidates for CME-generating events of the period (seen as 'coronal dimmings' in time-integrated extreme UV). These will be analysed very shortly for any Earth-bound components. Processing courtsery SIDC ROB.

Regarding possible sources for Coronal Mass Ejection (CME) activity in the period, a possible

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arriving region in the northeast was responsible for a long-period Common-class flare peaking around 22/0400UTC. This was tied to a CME seen heading east of the Sun-Earth line in subsequent imagery. This has yet to be analysed. Also noted in the 24 hours was a 'disappearing filament' in the southeast at both 22/1330UTC and again at 22/0500UTC, as a well as a third event at 21/1700UTC - all will be analysed shortly. A northwestern solar quadrant 'filament' became mobile from 22/0300UTC, appearing to migrate westward by 0500UTC. Imagery is being monitored for any associated ejecta. Finally, a series of minor high latitude CMEs emanated from the northwest in the period. While these too have also yet to be analysed, there is no obvious front-sided source, and a far-sided solution seems more likely (to no effect).

At present then, there are no new confirmed Earth-directed CMEs.

Solar Wind / Geomagnetic Activity: The solar wind showed an ongoing weak connection to a 'coronal hole' fast wind.

Solar wind speeds have been slightly elevated over the past 24 hours, with an overall declining trend. The number of particles comprising the wind was within single figures over the same interval on a level trend, as was the associated magnetic field. The north-south component was mainly co-aligned with Earth's until 1900 and after 0700UTC, else being more anti-aligned (to greater effect).

The net result of the above solar wind measures was nevertheless for mainly quiet geomagnetic activity.

Energetic Particles / Solar Radiation: No solar radiation storms have been observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be moderate, with isolated or occasional Moderate-class flares and a slight chance of Strong-class flares.

Solar Wind / Geomagnetic Activity: The end of the current UTC week carries greater than average uncertainty. No definitively Earth-directed CMEs feature, and the magnitude of initial fast winds is expected to be modest. A gradual descent to background solar wind speeds in a slow regime is expected into the UTC weekend.

There is a slight chance of a G1/Minor Storm interval on days one and two (22 and 23 June), should any resurgent fast wind combine with a glance from a CME, however perhaps the more likely state of affairs is for activity to remain below G1 throughout and become increasingly quiet over the four days.

Energetic Particles / Solar Radiation: There remains a daily slight chance of reaching the S1/Minor Storm threshold given the sheer number of sunspot regions and complexity of the current front-side. On balance the risk is also felt to rise slightly, as fewer large sunspots are moving away from the best-connecting (with Earth) western solar horizon (on the far side) than are moving towards it (on the front side). This leads to a gradual increase in risk, although it remains the case that no recent even very modest proton-generating events have been observed.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	10	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	75	75	75	75
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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